

AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Sensor Description

Manufacturer/Model:
IQAir AirVisual Pro

Pollutants:

PM_{2.5}

PM₁₀

CO₂

VOC

Type: Optical

Time Resolution: 10 second



Additional Information

Field evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/field>

Lab evaluation report:

<http://www.aqmd.gov/aq-spec/evaluations/laboratory>

AQ-SPEC website:

<http://www.aqmd.gov/aq-spec>

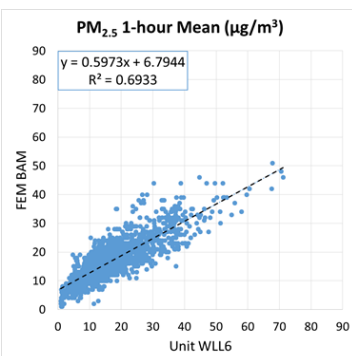
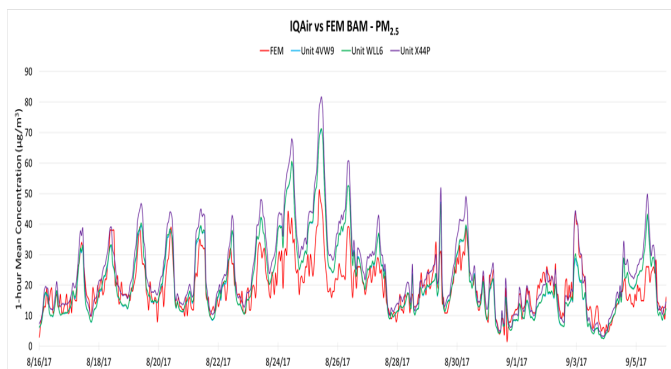
Evaluation Summary

- Overall, the three IQAir AirVisual Pro sensors showed low accuracy. They overestimated the FEM GRIMM PM_{2.5} measurements for a concentration range between 0 to 250 µg/m³.
- The three IQAir AirVisual Pro sensors exhibited high precision for all T/RH combinations tested in the environmental chamber.
- IQAir AirVisual Pro sensors (units IDs: 4VW9, WLL6, X44P) showed low intra-model variability in the field deployment as well as in the laboratory testing.
- IQAir AirVisual Pro sensors had good data recovery (>98% for 5-min average in the field, and 100% for 1-min average in the laboratory).
- For PM_{2.5}, the IQAir AirVisual Pro sensors had good correlation with the reference instrument from the field ($R^2 > 0.69$) and excellent correlation with laboratory studies ($R^2 > 0.99$).

Field Evaluation Highlights

- Deployment period 08/02/2017– 10/05/2017: the three IQAir AirVisual Pro sensors (units IDs: 4VW9, WLL6, X44P) correlated well with PM_{2.5} concentration change as monitored by FEM BAM.
- The units showed > 98% data recovery as well as low intra-model variability.

$R^2 > 0.69$



Coefficient of Determination (R^2) quantifies how the three sensors followed the PM concentration change by GRIMM.

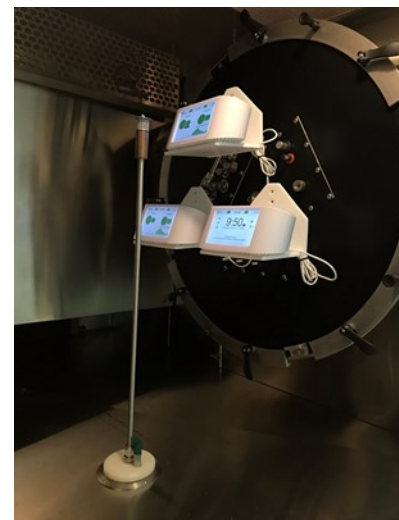
An R^2 approaching the value of 1 reflects a near perfect agreement, whereas a value of 0 indicates a complete lack of correlation.

Laboratory Evaluation Highlights

Accuracy (PM_{2.5})

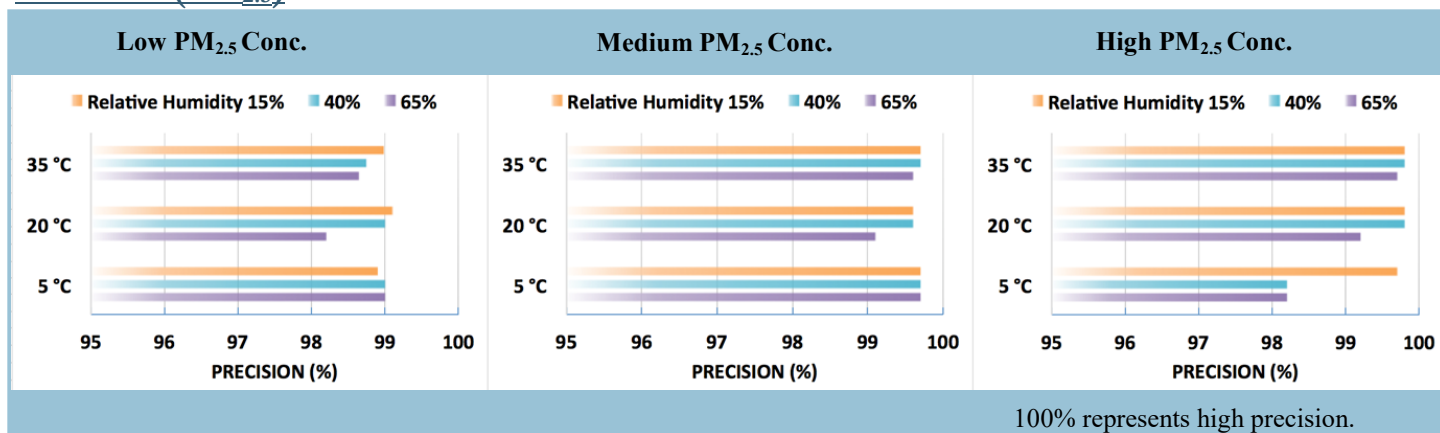
Steady State (#)	Sensor mean (µg/m ³)	GRIMM (µg/m ³)	Accuracy (%)
1	21.3	10.9	5.2
2	69.0	33.5	-6.2
3	154.6	79.3	5.0
4	288.6	153.0	11.4
5	440.0	228.5	7.4

$$A (\%) = 100 - \frac{|\bar{X} - \bar{R}|}{R} * 100$$



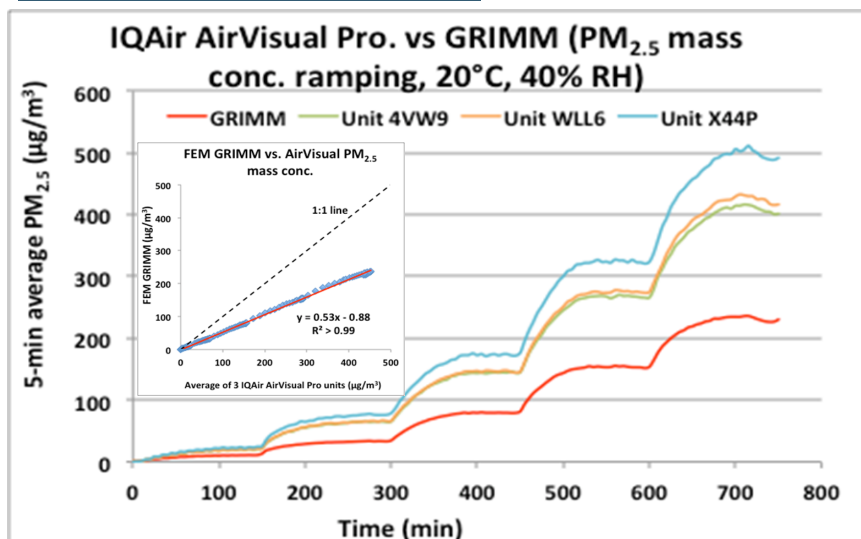
Accuracy was evaluated in a concentration ramping experiment at 20 °C and 40%. The sensor's readings at each ramping steady state condition are compared to those from the reference instrument.

Precision (PM_{2.5})



Sensor's ability at generating precise measurements of PM concentration at low, medium, and high pollutant levels were evaluated under 9 combinations of T and RH, including extreme weather conditions like cold and dry (5 °C and 15%), cold and humid (5 °C and 65%), hot and humid (35 °C and 65%), or hot and dry (35 °C and 15%).

Coefficient of Determination



The three IQAir AirVisual Pro sensors showed excellent correlation with the corresponding FEM PM_{2.5} data ($R^2 > 0.99$) at 20 °C and 40% RH.

Climate Susceptibility

From the laboratory studies, temperature and relative humidity had minimal effect on the IQAir AirVisual Pro sensors' precision. At the set-points of RH changes, IQAir AirVisual Pro reported spiked changes in concentrations.

Observed Interferents

N/A



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